

REFRIGERATOR WITH AN INNER CASE CONTAINING
NANOSILVER PARTICLES

Field of the Invention

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The present invention relates to a refrigerator with an inner case for defining an inner space of the refrigerator; and, more particularly, to a refrigerator including an inner case divided into two parts one of which contains nanosilver particles exhibiting optimal antibacterial and/or antifungal functions.

Background of the Invention

15 In general, silver (Ag) is well-known as a common antibacterial agent. In particular, colloidal silver is known as being safe and effective against, bacteria, fungi, microbes, virus and the like. When silver ions are absorbed into cells of virus, bacteria, fungi and the like, the silver ions prevent the growth of enzyme required in respiration thereof to render them dead. Further, silver ions prevent metabolism of the bacteria and suppress reproduction thereof.

25 Fine particles of silver can be produced by a physical process such as electrolysis, liquid phase reduction, and grinding. The electrolysis has mainly been used hitherto

in order to obtain stabilized nanosilver particles with a high purity. In the electrolysis process, pure silver (99.99%) is immersed into distilled water; and extremely fine particulates of silver are obtained by applying a low
5 current at a low temperature.

Meanwhile, a refrigerator serves to preserve food in a fresh state for an extended period of time in a food storage compartment by cooling air in the compartment using a refrigeration cycle. In the refrigerator, refrigerant
10 gas compressed under a high temperature and a high pressure by a compressor is condensed into liquid phase in a condenser; and the liquid is then pressure-reduced through an expansion valve and evaporated in an evaporator. At this time, the evaporating refrigerant takes heat from the
15 ambient air to cool it. The cooled air is then forced into the food storage compartment by, e.g., a fan.

A study on employing the above-described nanosilver for an antibacterial purpose in the refrigerator has been conducted, in which the inner case of the refrigerator,
20 which defines an inner space of the refrigerator, serves the antibacterial purpose by making it of nanosilver.

The inner case of the refrigerator is typically made of acrylonitrile butadiene styrene("ABS") copolymer since the styrene base resin such as the ABS copolymer has an
25 excellent mechanical property, workability, appearance, gloss and the like. The inner case of the refrigerator is

manufactured by the ABS copolymer to a sheet and then performing a vacuum forming process on it.

The vacuum forming process is one type of plastic forming process, the vacuum forming process including
5 extruding a resin to a sheet, heating and softening the sheet in a vacuum forming machine to form a softened sheet, and drawing the softened sheet to a mold so as to form it into a shape required by using a vacuum of air or a vacuum and a compact of air to manufacture a desired product.
10 This vacuum forming process is widely used to produce the inner case of the refrigerator.

Such an inner case is mixed with nanosilver particles by adding nanosilver particles to the ABS solvent contained in the master batch. This permits nanosilver to be
15 wastefully used since nanosilver particles are added even in forming a portion of the inner case in which antifungal function is not required. Accordingly, such production is cost ineffective.

20 Summary of the Invention

It is, therefore, a primary object of the present invention to provide a refrigerator including an inner case capable of having reduced amount of nanosilver particles to
25 be contained therein.

In accordance with an aspect of the present invention,

there is provided a refrigerator including: an inner case having an inner sheet for defining an inner space of the refrigerator and an outer sheet formed on the inner sheet, the inner sheet containing nanosilver particles therein.

5 Preferably, the inner sheet and the outer sheet are bonded to each other by a double extrusion molding technique.

Brief Description of the Drawing

10 The above and other objects and features of the present invention will become apparent from the following description of preferred embodiments given in conjunction with the accompanying drawing in which:

 The drawing is a schematic cross sectional view of an
15 inner case of a refrigerator in accordance with the present invention.

Detailed Description of the Preferred Embodiments

20 A preferred embodiment of the present invention will now be described in detail with reference to a drawing showing a schematic cross sectional view of a case of a refrigerator in accordance with the present invention.

 As shown, the case includes an inner case 10, an outer
25 case 30 for forming an appearance of the refrigerator and a heat insulating material 20 provided therebetween.

The inner case 10 has an inner sheet 12 for defining an inner space of the refrigerator and an outer sheet 14 formed on the heat insulating material 20. The inner sheet 12 may come into contact with food, the user or the air contaminants and thus the antifungal function is required, while the outer sheet 14 does not. Accordingly, nanosilver particles having antifungal function are contained in the only inner sheet 12 while the outer sheet 14 is made of a typical acrylonitrile butadiene styrene("ABS") copolymer. This reduces amount of the nanosilver particles to be used in the inner case 10. Accordingly, it is preferable that the thickness of the inner sheet 12 is minimized so as to further decrease amount of nanosilver to be contained therein. The inner sheet 12 and the outer sheet 14 are bonded to each other by, e.g., a double extrusion molding technique.

In the preferred embodiment of the present invention, the size of the nanosilver particles is limited to about 15~300 nm in consideration of the current manufacturing technique and the efficiency of specific surface area per unit weight.

Further, the concentration of the nanosilver added to the inner sheet 12 is limited to a range of about 1~500 ppm by weight such that the expensive nanosilver can efficiently be used and a target antibacterial ability can be obtained. As the concentration of the nanosilver is

increased, the antibacterial ability is enhanced; however, it is found that, in the range of 50~500 ppm by weight, there is no significant difference in the antibacterial ability. In addition, in the above concentration range of
5 nanosilver, the sterilization or bacteriostasis can be performed stably and efficiently.

With such an inner case of the refrigerator, it is possible to reduce the product cost of the refrigerator since amount of nanosilver particles to be contained in the
10 inner case thereof is reduced.

While the invention has been shown and described with respect to the preferred embodiments, it will be understood by those skilled in the art that various changes and modifications may be made without departing from the spirit
15 and scope of the invention as defined in the following claims.